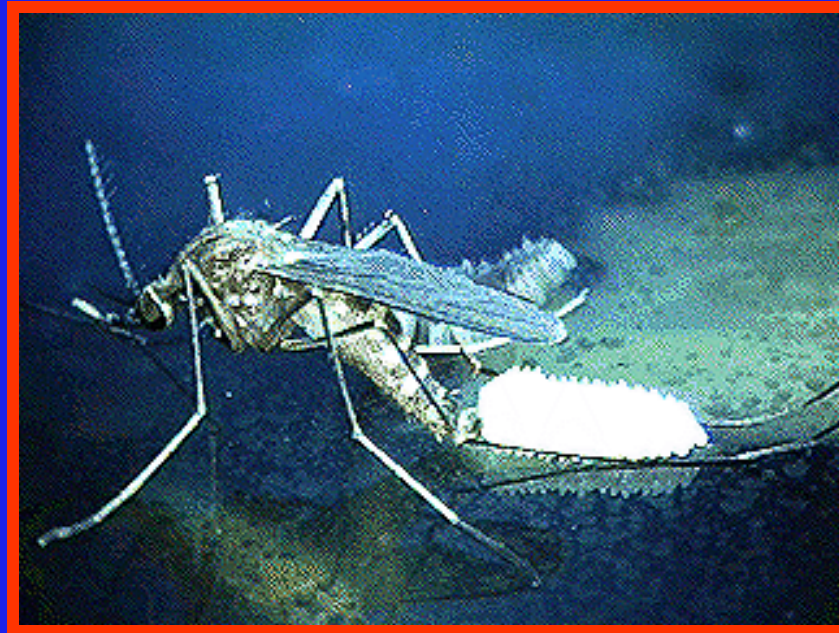


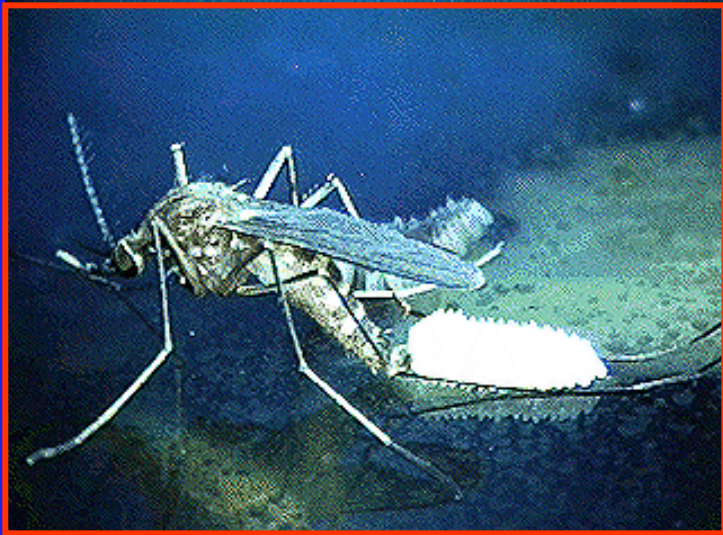
West Nile Virus



What You Need to Know

West Nile Virus

West Nile virus, which can cause encephalitis, is transmitted by mosquitoes.



The virus was first detected in the United States in August 1999.

West Nile Virus

Prior to 1999, the West Nile virus had only been found in Africa, Eastern Europe, West Asia, and the Middle East.

- St. Louis encephalitis
- * Rocio & St. Louis (Brazil)
- + West Nile virus
- # Japanese encephalitis
- West Nile & Japanese
- Japanese & Murray Valley
- 0 Murray Valley & Kunjin



West Nile Virus

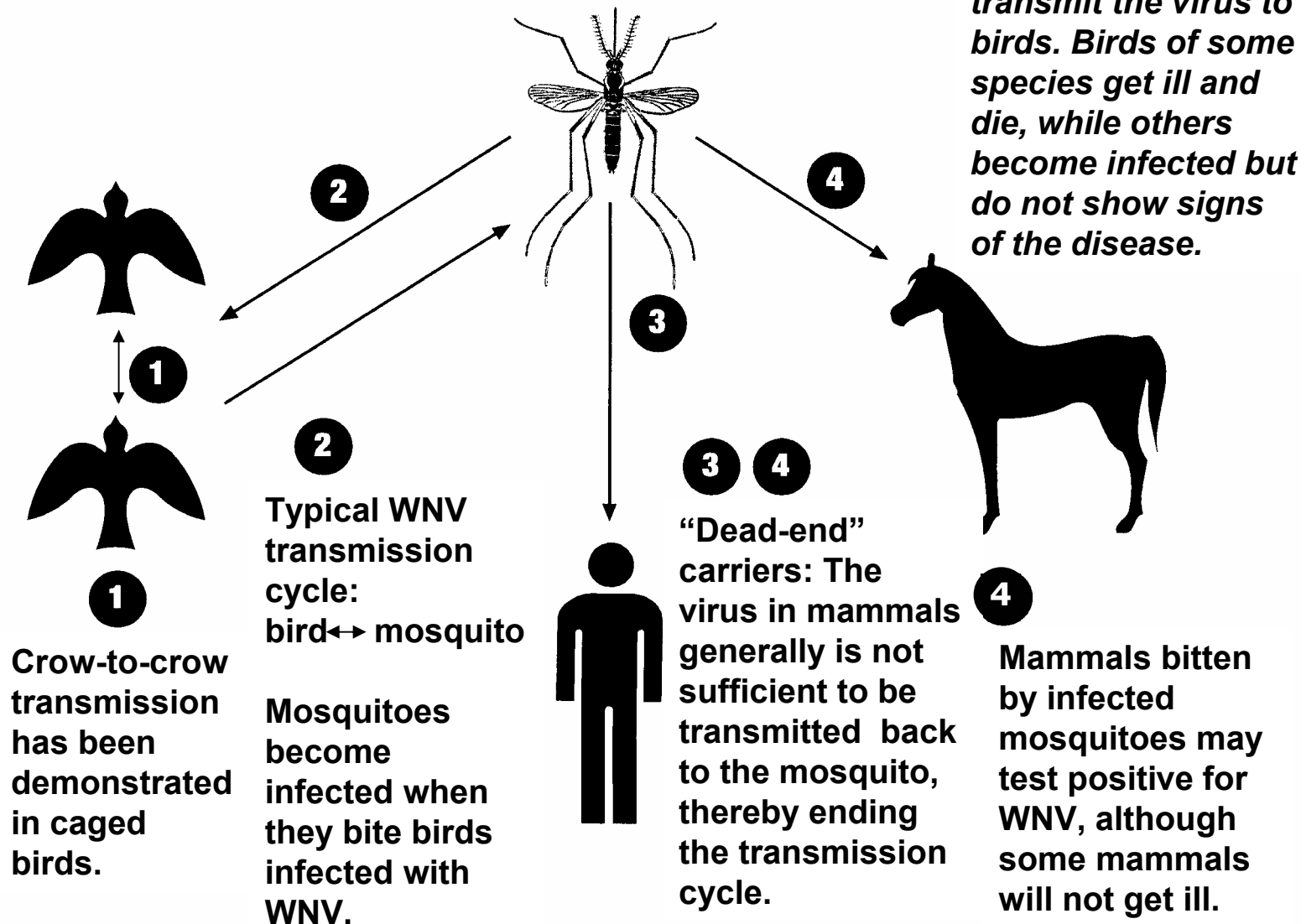
The virus was most likely introduced from an infected mosquito or bird that was imported from a country where the virus is common.



Transmitting West Nile Virus

Transmitting West Nile Virus

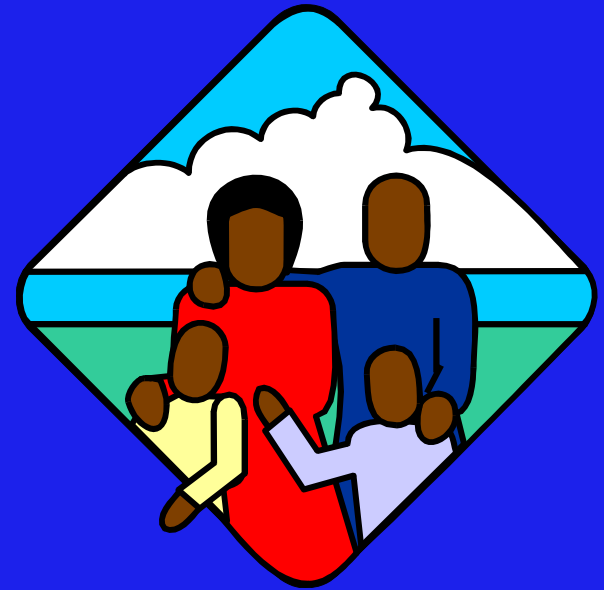
Basic Transmission Cycle of the West Nile Virus



Transmitting West Nile Virus

West Nile Virus is transmitted from the bite of an infected mosquito, primarily the **Culex** species.

Data indicated that 55% of the WNV-positive mosquito pools collected in 2002 were **Culex** species.



Transmitting West Nile Virus

Culex pipiens

(Northern House Mosquito)

- Common domestic pest
- Reaches greatest numbers in urban areas
- Thrives in polluted water habitats



Transmitting West Nile Virus

Culex pipiens (Larval Habitat)

- Lays its eggs on standing water
- Oviposits in containers & polluted groundwater
- Does not fly far from its breeding habitat



Transmitting West Nile Virus

In the U.S., 36 different mosquito species have been reported WNV-positive since 1999.

Of greatest concern in terms of risk to human health (and horses) are vector species that feed readily on large mammals (e.g., *Culex* spp. and *Aedes vexans*).

Transmitting West Nile Virus

Aedes vexans

(Common Floodwater Mosquito)

- Occurs in much larger numbers
- Avid human biter
- The ideal bridge vector for WNV in suburban areas



Transmitting West Nile Virus

Floodwater Mosquito

(Larval Habitat)

- Any body of transient water
- Number of summer broods dependent on rainfall



Transmitting West Nile Virus

Eggs Remain Dormant until Flooded



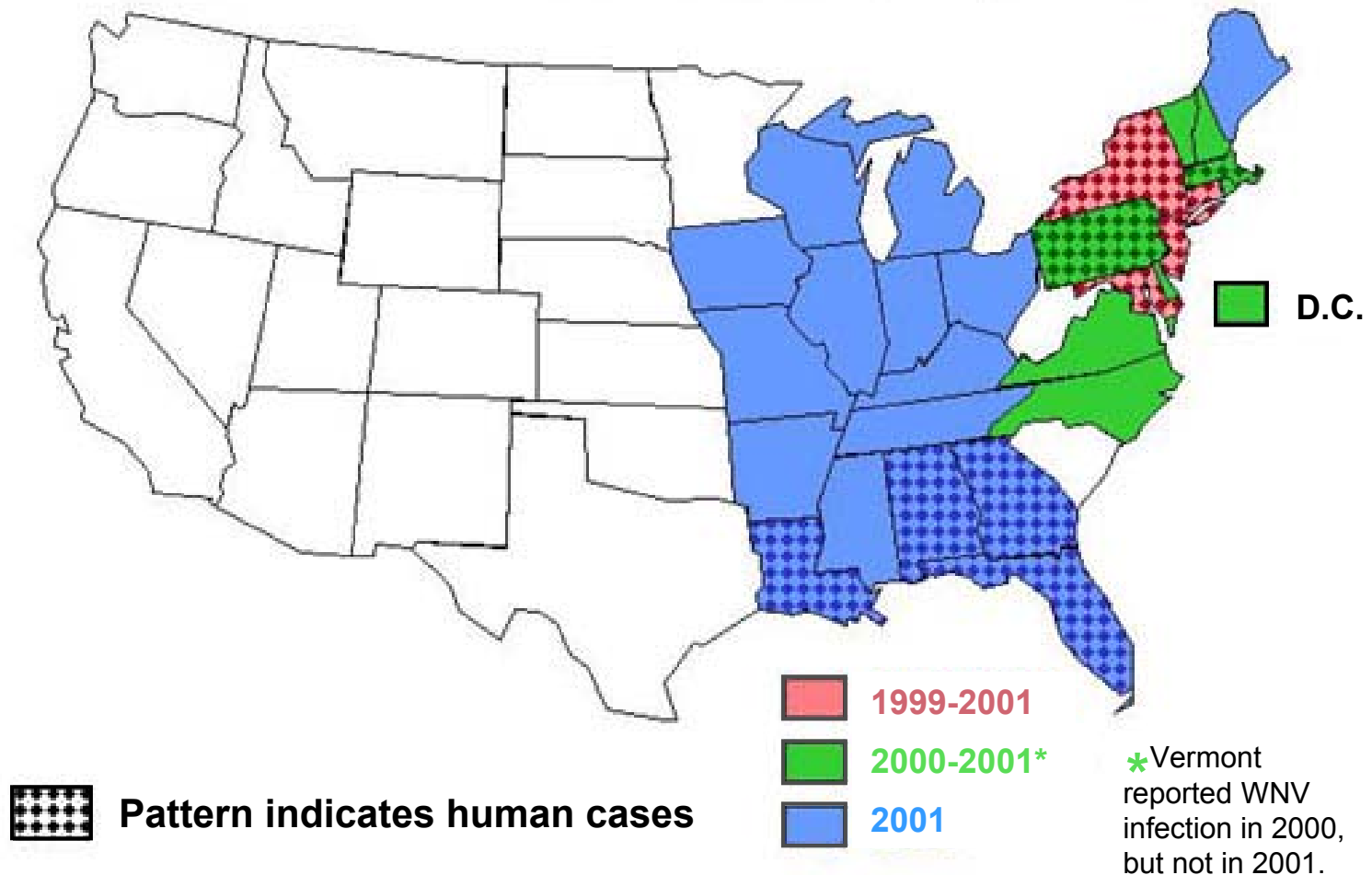
Transmitting West Nile Virus



Large Numbers of Larvae Appear after each Rain

Transmitting West Nile Virus

West Nile Virus in the United States, 1999-2001



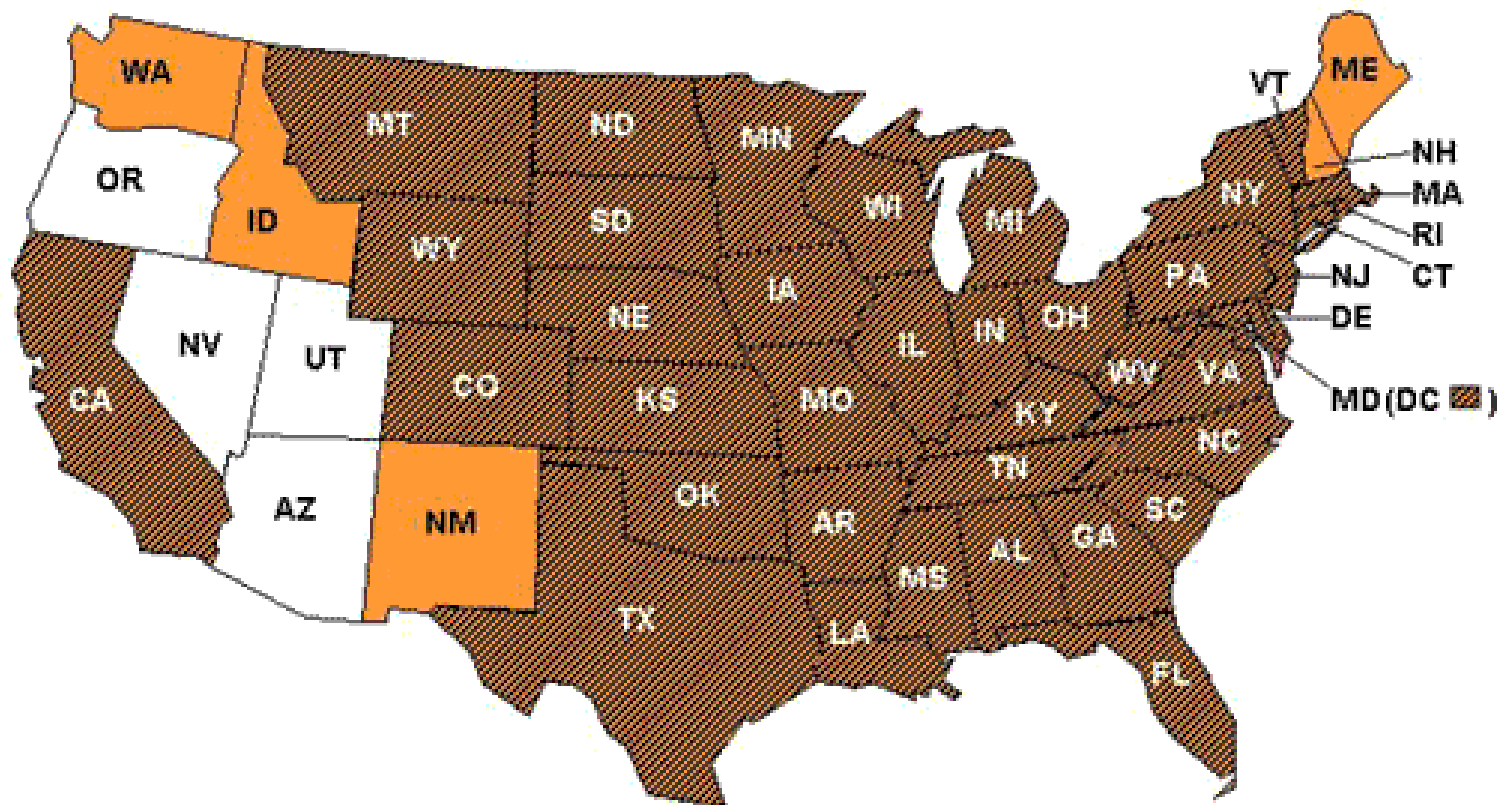
Transmitting West Nile Virus

As of December 2002, 44 states and Washington D.C. had WNV detections.

Detections Found In	# of States	~ # of Detections
Birds	42	16,677
Mosquitoes	36	6,291
Horses	41	14,640
Humans	39	3,873

Transmitting West Nile Virus

West Nile Virus in the United States, 2002



Verified avian, horse, and mosquito infections



Indicates human case(s) as well as avian, horse, and mosquito infections

Transmitting West Nile Virus

Birds are the primary reservoir for the West Nile virus.

Mosquitoes get the virus from taking a blood meal from an infected bird.

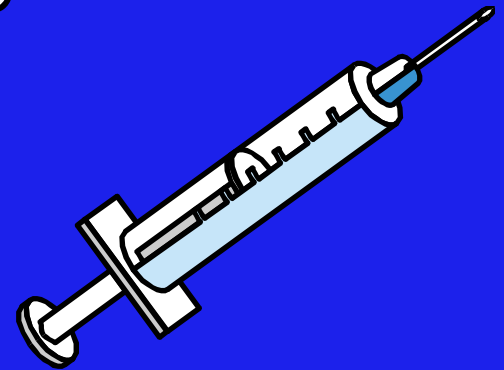
Health Information About West Nile Encephalitis

Health Information about West Nile

Encephalitis -- inflammation of the brain -- can be caused by head injury, bacterial infections, or most commonly, viral infections.

Health Information about West Nile

- Although there is no human vaccine against West Nile encephalitis, research is currently being done to develop one.
- There is no specific treatment, medication, or cure, but the symptoms and complications of the disease can be treated.



Health Information about West Nile

- All residents of areas where virus activity has been identified are at risk of getting West Nile encephalitis.
- People over 50 years of age have the highest risk of severe disease.
- It is now unknown if immuno-compromised persons are at increased risk for WNV disease.



Health Information about West Nile

- Most people who are infected have no symptoms or experience mild illness such as fever, headache, and body aches. Some people may develop a skin rash or swollen lymph glands.

Health Information about West Nile

- In rare cases, severe illness may occur. Some symptoms include: headache, high fever, a stiff neck, disorientation, coma, convulsions, and muscle weakness.
- In 2002, CDC reported 3,873 human cases of WNV, of which 246 people died.

Health Information about West Nile

- West Nile virus can be transmitted through blood transfusions and organ transplants.
- This new method of transmission was determined when four organ recipients tested positive for WNV after receiving organs from the same donor.
- The CDC is investigating other cases.

Health Information about West Nile

- Although persons needing blood transfusions or organ transplants need to be aware of the risk for WNV infection, the benefits of receiving needed transfusions or transplants outweigh the potential risk for WNV infection.

Health Information about West Nile

- There is no risk of getting WNV by donating blood.
- The Food and Drug Administration (FDA) is facilitating the development of commercial tests for detection of acute infection with WNV in blood and plasma donors and potentially for tissue and organ donors.

Health Information about West Nile

- West Nile virus is NOT transmitted from person-to-person. You cannot get WNV from touching or kissing a person who has the disease, or from a health care worker who has treated someone with the disease.

Health Information about West Nile

- WNV transmission has now been documented from mother to fetus. While pregnant, a female became infected with WNV; her baby was born with the virus. Although the baby's life is not in danger, the viral infection may have caused health problems affecting the infant's central nervous system.

Health Information about West Nile

- Other suspected modes of transmission include:
 - Breast milk from nursing mothers, infected with WNV, to their infants
 - Infection from handling infected animals in a lab (skin was cut while handling infected animals)

Effects of the West Nile Virus on Animals

Effects of the West Nile Virus on Animals

West Nile virus has been responsible for many bird and horse deaths.



Effects of the West Nile Virus on Animals

American Crows are highly sensitive to the West Nile Virus and have a greater than 90% mortality rate.



Effects of the West Nile Virus on Animals

- Crows exhibit symptoms including rapid weight loss and an inability to perch. They usually die within 4-6 days after being infected.
- Monitoring American crow deaths is especially important since they are sentinels for local transmission of the disease.

Effects of the West Nile Virus on Animals

- Crow to crow transmission of the West Nile virus was documented by placing diseased and healthy crows in a common flight cage.
- All healthy crows eventually died from being exposed to diseased birds.
- This research study was done by USGS personnel in Madison, WI.

Effects of the West Nile Virus on Animals

Many other species of birds have been found infected with the virus. The following is a partial list of birds that have tested positive:

American Goldfinch
American Kestrel
American Robin
Belted Kingfisher
Black Skimmer
Bluejay

Canada Goose
Canada Warbler
Captive birds
Cardinal
Cedar Wax Wing
Chicken

(Other birds con't)

Cockatoo	Killdeer
Common Grackle	Macaw
Common Nighthawk	Merlin
Cooper's Hawk	Mourning Dove
Cormorant spp.	Mute Swan
Eastern Bluebird	Northern Mockingbird
Eastern Wild Turkey	Ovenbird
European Starling	Red-tailed Hawk
Fish Crow	Red-winged Blackbird
Gray Catbird	Ring-billed Gull
Great Black-backed Gull	Ring-necked Pheasant
Great Blue Heron	Rock Dove
Great Horned Owl	Ruffed Grouse
Green Heron	Sharp-shinned Hawk
Herring Gull	Song Sparrow
House Finch	Wood Thrush
House Sparrow	Yellow-rumped Warbler

Effects of the West Nile Virus on Animals

- In addition, suspected WNV infections have been detected in other animals including the following:
 - Wolf
 - Reindeer
 - Black Bear
 - Mountain Goat
 - Barbary Macaque (primate)
 - Dog
 - Sheep
 - Squirrel
 - Alligator
 - Harbor Seal

Monitoring for the West Nile Virus

Monitoring for the West Nile Virus

State agencies, local governments, health professionals, and Penn State are working together to find and control the mosquitoes known to carry the virus.

Monitoring for the West Nile Virus

The Commonwealth has established a surveillance program which includes:

- Trapping and testing mosquitoes,
- Testing fresh, dead crows for the virus, and
- Identifying areas of greatest risk.

Monitoring for the West Nile Virus

2002 PA West Nile Surveillance Program Results

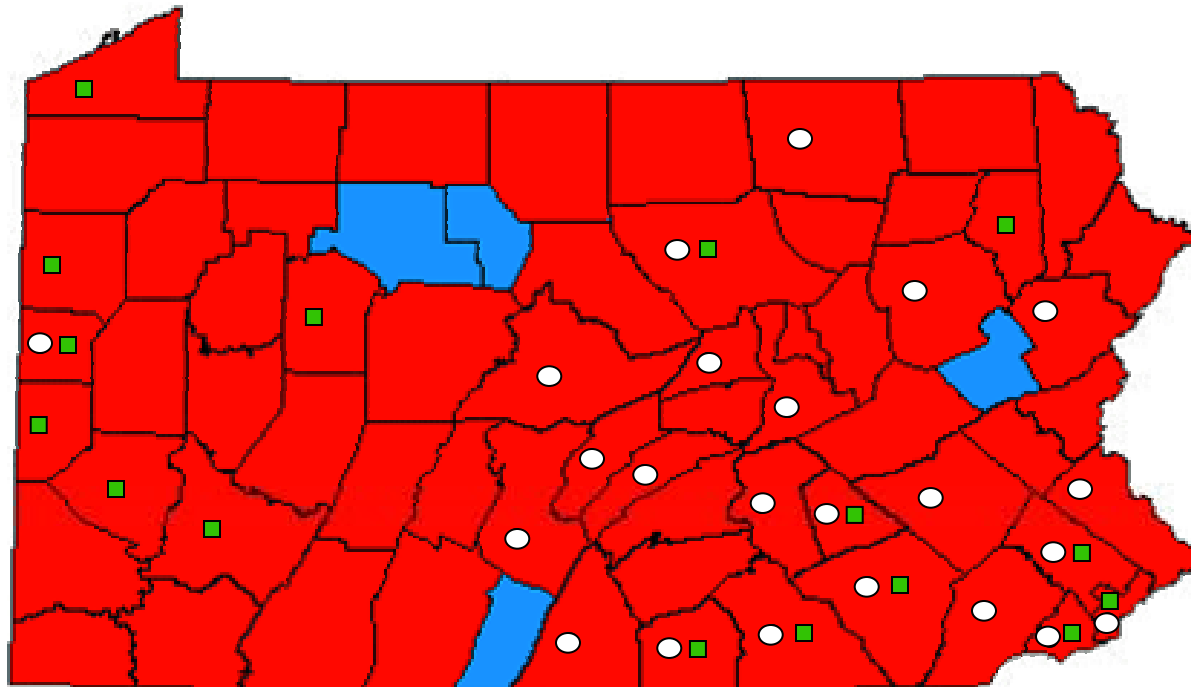
Total Number of Detections

1,436 Birds

673 Mosquitoes

84 Horses

60 Humans (8 deaths)



Counties with No Detections

Elk
Cameron
Fulton
Carbon



Virus Not
Detected



Mosquitoes &/or
Birds Detected



Horses
Detected



Humans
Detected

Mosquito Pest Management and Control

Mosquito Pest Management and Control

The number of mosquitoes around your home and neighborhood can be reduced by eliminating sources of standing water in which mosquitoes lay their eggs.



Mosquito Pest Management and Control

- Turn over wheelbarrows and do not allow water to stagnate in birdbaths.
- Turn over plastic wading pools when not in use.
- Empty urns and vases in cemeteries.



Mosquito Pest Management and Control

- Dispose of tin cans, plastic containers, ceramic pots, or similar water-holding containers that have collected on your property.

Do not overlook containers that have become overgrown with vegetation.



Mosquito Pest Management and Control



- Pay particular attention to discarded tires. Used tires are the most important breeding site for mosquitoes in the country.

Mosquito Pest Management and Control

- Clean and chlorinate swimming pools that are not being used.



Mosquitoes may breed even in water that collects on swimming pool covers.

Mosquito Pest Management and Control

- Drill holes in the bottom of all containers that are left outside. Containers with drainage holes on their sides can still collect enough water for mosquitoes to breed.



Mosquito Pest Management and Control

- Clean clogged roof gutters every year, particularly if leaves tend to plug the drains.

Roof gutters can produce millions of mosquitoes each year.



Mosquito Pest Management and Control



- Aerate ornamental pools or stock them with fish. Water gardens are fashionable but become major mosquito breeding sites if allowed to stagnate.

Mosquito Pest Management and Control

- Modify the landscape to eliminate standing water that collects on your property.



Mosquito Pest Management and Control

- During warm weather, mosquitoes will breed in any puddle of water.



Mosquito Pest Management and Control

- In urban settings, catch basins are a major mosquito producer.



Reducing the Risk of a Mosquito Bite

Reducing the Risk of a Mosquito Bite

- Stay indoors at dawn, dusk, and in the early evening. If you do go outdoors at these times, wear long-sleeved shirts and long pants.
- Make sure window and door screens are “bug tight.”

Reducing the Risk of a Mosquito Bite

- Apply insect repellent sparingly to exposed skin and thin clothing.

Read and follow the product label.



Reducing the Risk of a Mosquito Bite

- Use the proper type of lighting outside: incandescent lights attract mosquitoes while fluorescent lights neither attract nor repel them.
- Note that Vitamin B and “ultrasonic” devices have not been proven effective in preventing mosquito bites.

Using Insect Repellents Properly

Using Insect Repellents Properly

Products containing 10-35% DEET will provide adequate protection under most conditions.

The American Academy of Pediatrics

recommends that repellents used on children contain no more than 10% DEET.



Using Insect Repellents Properly

- Alternatives to DEET:
 - Avon's Skin-So-Soft Bath Oil
 - Avon's Skin-So-Soft Bug Guard
plus IR3535 Insect Repellent lotion
with sunblock
 - Bite Blocker (plant based repellent)
 - Citronella oil
 - Plant-derived repellents (citronella,
geranium, lavender, etc.)
 - Permethrin (apply to clothes only)

Using Insect Repellents Properly

- Before using, read and understand the directions on its label.
- Use just enough repellent to lightly cover exposed skin and clothing. Do not saturate the skin or apply beneath clothing.

Using Insect Repellents Properly

- To apply to face, first spray or dispense on your palms and rub your hands together. Then apply a thin layer to your skin.
- Do not apply a repellent directly to a child's skin. First apply it to the palms of your hands and then apply it to the child.



Using Insect Repellents Properly

- After applying a repellent, wipe or wash it from your hands.



- Once indoors, wash all treated skin and clothing with soap and water.

Using Insect Repellents Properly

- If you suspect that you or your child is reacting negatively to a repellent, discontinue its use, wash treated skin, and call the new National Poison Center hotline. You will then be transferred to a regional poison center.



Pesticides Used for Mosquito Control

Pesticides Used for Mosquito Control

Insecticides used to control mosquitoes must meet EPA requirements that ensure no harm to human and animal health and the environment when used according to the label.

Pesticides Used for Mosquito Control

Mosquito Adulticides

Malathion & Naled (organophosphates)

Sumithrin & Resmethrin (synthetic pyrethroids)

Mosquito Larvicides

Temphos (organophosphate)

Methoprene (insect growth regulator)

Oils & Monomolecular films

Bacillus sphaericus & *Bacillus thuringiensis israelensis* (biological pesticides)

Pesticides Used for Mosquito Control

- **Malathion** -- To protect the public and the environment, EPA requires that malathion be applied only by professionals as a fine spray at very low rates from trucks or aircraft. Malathion kills adult mosquitoes when they contact spray particles in the air.

Pesticides Used for Mosquito Control

- **Naled** -- is an insecticide applied as an ultra-low volume spray from trucks or aircraft. It is primarily used on land to kill adult mosquitoes and blackflies.

Pesticides Used for Mosquito Control

- **Sumithrin** -- is an insecticide used against mosquitoes in swamps, marshes, and recreational areas. It is similar in its action to natural pesticides found in chrysanthemums. Sumithrin degrades rapidly in the environment when used at low concentrations for mosquito control.

Pesticides Used for Mosquito Control

- **Resmethrin** -- is an insecticide used to control flying and crawling insects in homes, lawns, gardens, and at industrial sites. It is registered only for outdoor use and is generally applied in small amounts. Resmethrin has low toxicity to humans, but is very toxic to fish and other aquatic organisms.

Pesticides Used for Mosquito Control

- **Temphos** -- is an insecticide used to control mosquito larvae and is usually applied by helicopters. Temphos breaks down within a few days and does not pose unreasonable risks to human health. Temphos is applied directly to water so it is not expected to have a direct impact on land animals. It can be highly toxic to some birds and aquatic organisms; it is toxic to bees.

Pesticides Used for Mosquito Control

- **Methoprene** -- is an insect growth regulator used to kill mosquito larvae. When used according to the label, it does not pose unreasonable risks to human health. The toxicity is low for birds and fish and it is nontoxic to bees. Methoprene breaks down quickly in water and soil, and will not leach into groundwater.

Pesticides Used for Mosquito Control

- **Oils and Monomolecular Films** -- are used to form a coating or thin film on water surfaces, which drowns larvae, pupae, and emerging adult mosquitoes. Both oils and films, when used according to the label, do not pose a risk to human health. Oils that are misapplied may be toxic to fish and other aquatic organisms.

Pesticides Used for Mosquito Control

- **Bacillus sphaericus** and **Bacillus thuringiensis israelensis** -- are biological pesticides used to control mosquito larvae in water. Larvae eat these bacteria, which in turn release proteins that disrupt the larval feeding process, causing them to starve and die. Both pose no hazards to humans and wildlife.

Pesticides Used for Mosquito Control

- Mosquito dunks, with the **Bacillus thuringiensis israelensis** active ingredient, can be thrown into standing water to control mosquito larvae.



Pesticides Used for Mosquito Control

To reduce exposure during mosquito control spraying, there are a number of common-sense steps you can take to help reduce possible exposure to pesticides.

- Look for notices about spraying in the newspapers and listen for radio and TV announcements.

Pesticides Used for Mosquito Control

- Whenever possible, remain indoors with the windows closed and air conditioning turned off when spraying is taking place.
- Bring your pets indoors and cover ornamental fish ponds.



Pesticides Used for Mosquito Control

- If you must be outdoors, avoid getting the spray in your eyes. If you do, immediately rinse your eyes with water.
- Wash exposed skin surfaces and clothing with soap and water if you contact pesticides.

Pesticides Used for Mosquito Control

- Bring laundry and toys indoors before spraying begins and wash, with soap and water, items that have been exposed to pesticides during spraying.



Pesticides Used for Mosquito Control

- Cover outdoor tables and play equipment or rinse them off with water after spraying is finished.



- Cover swimming pool surfaces when feasible.

Pesticides Used for Mosquito Control

- Wash home-grown or store-bought fruits and vegetables with water before storing, cooking, or eating them.
- If you have questions about pesticides, call the National Pesticide Information Center at (800) 858-7378.



For More Information:

Centers for Disease Control & Prevention
(970) 221-6400

<http://www.cdc.gov/ncidod/dvbid/westnile/index.htm>

Pennsylvania Department of Health
1-(877)-PA-HEALTH (724-3258)

<http://www.westnile.state.pa.us/>

Pesticide Education Program, Penn State

<http://www.pested.psu.edu/spWestNile.html>

PENNSTATE



This presentation was prepared on the recommendation of the West Nile Virus Coordinating Committee at Penn State.

"Penn State is committed to affirmative action, equal opportunity, and the diversity of its workforce."

Graphics in this presentation courtesy of Centers for Disease Control and Prevention; Dr. Wayne Crans, Rutgers University; Animal and Plant Health Inspection Service, USDA; On Line Photography Center, USDA; Pennsylvania Department of Environmental Protection; United States Geological Service; Marin/Sonoma Mosquito & Vector Control District in California; Penn State Land Analysis Laboratory, and Penn State Pesticide Education Program.

Data sources used to create the maps and tables in this presentation are from the following sources: Center for Integration of Natural Disaster Information, U.S. Geological Survey; Environmental Risk Analysis Program, Cornell University Center for the Environment; Animal and Plant Health Inspection Service, U.S. Department of Agriculture; Centers for Disease Control and Prevention; and links to individual state information listed on our web site (<http://www.pested.psu.edu>).